Available online at www.sciencedirect.com

SciVerse ScienceDirect

Procedia - Social and Behavioral Sciences 46 (2012) 209 – 215

Procedia
Social and Behavioral Sciences

WCES 2012

GIS and types of GIS education programs

Mustafa G. Korucu

Nicosia Turkish Municipality, GIS &Property Taxes Department/ Near East University, Faculty of Architecture, Nicosia, North Cyprus

Abstract

Recent developments in mapping technologies that forms data for planning and decision mechanism, makes it necessary to use these technologies by forming "*clever maps*" through geographical information systems (GIS). Up to now, the concept of GIS couldn't be understood both in educational institutions and at private sector. The importance of geographical information systems and its fields of use should be emphasized. GIS education in secondary education and universities must be a government policy. Different certificate programs for staff training both in private sector and governmental organizations should be encouraged to increase productivity and quick decision making. Universities in North Cyprus has realized the importance of GIS and started GIS education in different departments recently.

Keywords: *GIS, technology, education,government policy, certificate programs.*

1- Introduction:

Developments of the mapping technologies, which are input to planning, necessitated the use of technologies related to these methods within the planning and decision-making process nowadays. Digital maps, produced by photogrammetric methods or satellite images, gave new functions to the base maps which are being used in planning and setting up new scenarios. The "*clever maps*", which are stored in digital form are used as vector or raster data, allow many data analysis and revealed the need of storing these data in a specific order (Söğüt 2001).

In today's technologies, database management is used by many different disciplines. The storage of different kinds of data in a common database, eases the management and sharing of the information. In this context, the spatial and non spatial data that the public institutions and organizations and municipalities own, should be evaluated with a common database management system in accordance with the purpose of use. Especially, in recent years, available open source geographic information systems (open GIS) lowered the cost and cause the demanders to prioritize this issue. The wide use of these technologies, the data bank and the data sharing standards will prevent the information pollution and will provide fast and efficient access to information with an economic cost. (Korucu and Tecer, 2011)

Information technologies are developing and progressing very quickly every day. Information technologies are being utilized in the educational-application process nowadays. The use of geographical information systems (GIS) in social sciences and in many professional fields as well as engineering sciences, increased the need for qualified people. When the development of the computer technologies and the decrease of the software costs in the last 20 years are being considered, GIS concept is being taught in the GIS labs established in the universities as elective courses (Turoğlu, 2003). With the certified courses of the firms(vendors), which provide GIS software, it is aimed to reinforce the learning process and increase the interest to the subject. This issue must be addressed starting from secondary education and at the universities in North Cyprus and the personnel should be trained in this regard.

Mustafa G. Korucu Tel: 0392 -228 5221 ext: 1300
E-mail address: mustafa.korucu@lefkosabelediyesi.org

 doi:10.1016/j.sbspro.2012.05.095

The purpose of this study, is to introduce and start teaching GIS from secondary education to university as a country policy and contribute to the effective use of it with its ability to make querries analysis and take reports.

2- Geographic Information Systems and sub-systems

Geographic Information Systems (GIS) are the computer systems which are designed to show the form of the earth's physical and human characteristics of each kind of data collection in a database with real coordinates in accordance with the purpose of analysis done on them Also the presentation of results on maps, charts and graphs. Because of the above-mentioned properties, GIS have become indispensable for managers and planners in decision mechanism. To achieve this goal, all the data in GIS are stored separately in different layers and used in accordance with the desired purpose (Demirci, 2008).

Geographical Information Systems (GIS) include different systems which can be used for many purposes. GIS collects location based information, store, use for various aims, analyze and present it. Interactive information systems that meet a wide variety of GIS applications based on location, geometry and attribute information also allow questioning of data other than these. For this reason, it is completely within the scope of interdisciplinary studies, combining data from various and different fields. GIS approach is not evaluated from cartographers, also it was born from the requirements of environmental scientists and planners. GIS not only analyses, arranged and stored visual data but also converts it to different formats of data and provides to take output according to the aim of use (Göker, 2000).

GIS denoted with different names according to its fields of application. We can show them as shown below;

- Urban Information System
- Land Data System
- Geographically referenced Information System
- Multipurpose Cadastre
- Image Based Information System
- Cadastral Information System
- Spatial Information System
- Spatial Decision Support Info System
- Property Information System
- Planning Information System

In case of considering the needs of local governments and public-private sectors of the above mentioned sub-systems that are forming them, many staff should be trained in fields of analyst programmer about GIS, GIS system administrator, geographer and users in higher education. In recent years, both in Turkey and in North Cyprus, through forming urban information systems in municipalities and creating coordinated maps and putting them into service, all infrastructure information are digitized and logged into the system. Mapping Office, Land Registry Office, Urban Planning Office and an office related to the General Crop Insurance also started to transact by using coordinated map data. Therefore, the need for keeping all data in different layers emerged (Korucu, 2011). The need for sending coordinated and digitized maps that were prepared by private sector in the tenders and that were served for various aims (water, sewage lines etc.) to the central system will appear. In order to achieve this, it will be needed to have educated staff about the Geographical Information System. In short, not just in technical issues, but also in social branches and in different occupations, GIS can find an opportunity to be used and applied.

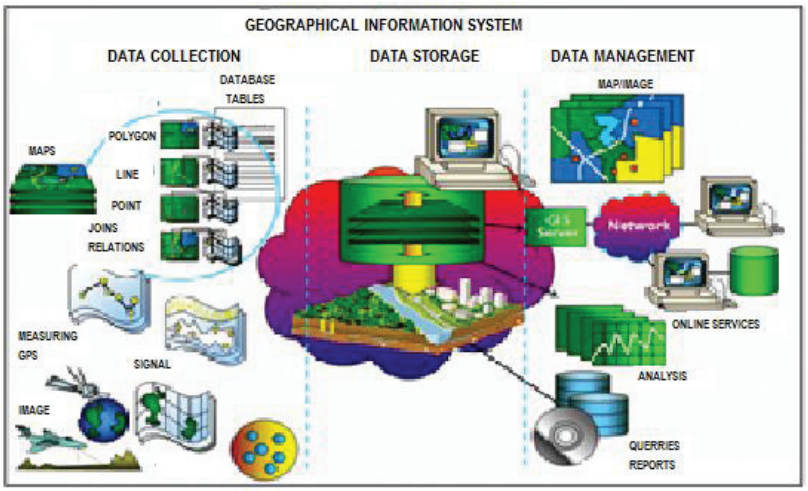

Fig. 1 Data movements in GIS (İşlem Şirketler Grubu, 2008)

3- Types of GIS Education

GIS is being used as a search tool in the level of universities, in more than 100 different academic disciplines. However, when we look at the GIS education, it can be observed that some disciplines come into prominence. Nowadays, in undergraduate and postgraduate level, the GIS education is given in the departments like geography, geodesy, photogrammetry, and also in ecological sciences, natural resources, forestry, civil engineering, landscape architecture, ecology, urban design and planning. (Demirci and Kocaman 2007).

In relation to the developments in computer technology, GIS has improved and the usage area has increased. The increase of software number, decrease in expenditures and usage flexibility in GIS applications caused to solve the problems of design and planning. It also caused to be used widely by the people who had no technological experience. Especially, in recent years, aiming to generalize the use of GIS in educational activities, many people, organizations, institutions and companies have done various studies and the result of these studies have started to be seen. For example, the contributions of GIS in the educational studies which were done at undergraduate level have realized and GIS started to be used in the secondary education institutions of the USA and Europe. This previously took place in yearly scheme of education in countries like U.S.A., Canada, Britain, Sweden, Denmark, Germany, Finland, and the Netherlands. Afterwards, together with geography courses, it was started to be used in courses like; science, chemistry, biology, mathematics, environmental sciences, and social sciences (Yiğit and oth., 2011).

According to Dahlberg (1983), GIS education in the United States can be explained by using “pancake with bubble” model. The pancake represents introductory level of courses in GIS offered by colleges and universities. The surface bubble represents the places where advanced courses are offered. Nowadays, GIS education varies according to the field of use from short hourly courses/workshops to graduate, post graduate courses (master and doctorate degree) and certificate programs. Online learning is also popular in this field with the development of internet technologies. In this context, it is possible to group the GIS education in 4 major points (Taş, 2004).

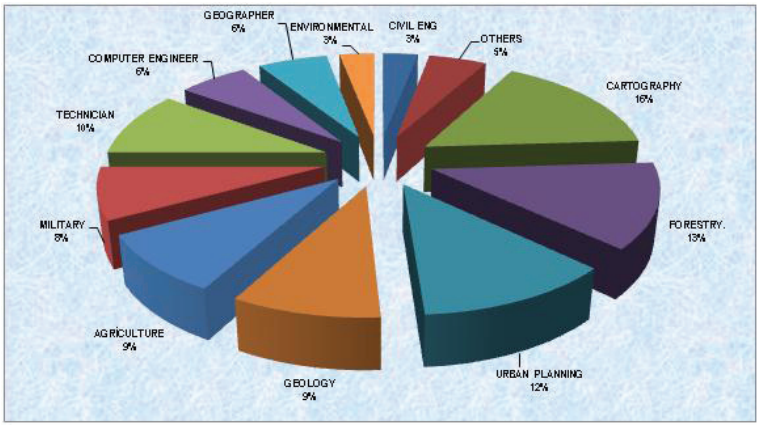

Fig.2 Distribution of the occupational groups who attended the ArcGIS courses from 2001 to 2007 (Küpçü, 2007).

a. Workshops and Seminars

Workshops (short courses) and seminars are popular in GIS education since the beginning of GIS education. These types of GIS courses are provided for specific goals and within a short period of time. No experience is necessary for the learners who desire to attend these courses. Some employers provide GIS courses for their personnel to give them opportunity to improve themselves regarding their interests (Wikle, 1998). If an employer has an experienced personnel, he may use the employee to give in-service training of GIS. The Nicosia Turkish Municipality, Urban Information System Department was taught ARCGIS by the representative company of ArcGIS in Turkey. Moreover, an authorized person from the department gave courses to 38 employees of the municipality at their building. The curriculum included basic use of GIS (Table 1).

Table 1 Introduction to ArcGIS course as an insevice training in Nicosia Turkish Municipality (Erengin and Korucu, 2009)

Number Of Days	Course Title
1	Introduction to GIS and Basic Concepts, Application Examples
1	Map Projection Systems & Application in Nicosia Turkish Municipality
2	Learning ArcGIS and ArcCatalog, other extensions, Arctoolbox, layer properties, select by attributes and select by location, Map layouts and prints
1	Data Management in ArcGİS (Feature editing, Table Editing)

b) Online Distance GIS Education

Online distance education is a system which enables trainers and students who are physically at separate locations to teach and get educated by using technology. Internet Based Distance Education has flexible course hours and is independent to the place. It provides low cost education and the person does not have to go to the school. (Bicen & Cavus, 2011; Karaş and others, 2011; Tavukcu, Gezer & Ozdamlı, 2009)

Distance Education is becoming increasingly popular especially in USA and Canada. This method is being applied for the people who does not have a chance to attend to the classes which are already open and wants to learn GIS. Courses are given by the universities and software programmers. The students who registered to the distance GIS education have different opportunities to get different degrees from certificate to diploma according to the feature of the program after completing every course. The students can follow the classes from video as well as from different sources on the internet (Wikle 1998; Lateh & Munıandy, 2011; Karahoca, Karahoca & Yengin, 2010).

In Turkey, the Anadolu University Open Education Faculty has been the pioneer of the distance education which has been active since 1982. With the development of internet technologies, the universities are working on the Internet Based Distance Education within the last few years. The universities which provide certificate programs,

undergraduate, and graduate level Distance Education in Turkey are; Anadolu University, Sakarya University, Ankara University, Karabük University, Mersin University etc. (Valderrama & Cruz, 2011; Karaş and others, 2011).

c) GIS Certificate Program

The certificate programs started in 1970's at the universities and collages in order to get very brief and detailed information on a specific subject. The certificate programs are usually under the responsibility of an academic institution which sets up the rules. The acceptance criteria change according to the design of the certificate program and may include compulsory attendance, pre-knowledge or course requirement. The number of credits which should be completed may also change from program to program within the same education institute (Wikle 1998).

d) GIS Expert Certificate

According to Wikle (1998) the Certificate of Approval is a process, applied to the students as an exam and evaluation in order to see if the student has enough knowledge on GIS. At the same time the Certificate of Approval shows the experience and the knowledge of the experts or the workers on a specified subject. By this way, only qualified people will be able to get into this area of expertise. With the certificate of approval, the experts will be able to renew their knowledge about the topic. Today in the countries where GIS is commonly used, while the GIS certificate of approval is given by the professional GIS organizations, each organization sets their own criteria. In recent years, some studies are implemented for bringing only one standard to these educations all over the world. (Taş, 2006)

4-Situation of the GIS Education in the Universities of North Cyprus

The GIS Education, which has been entered to High Education Programme in Turkey since 2002, has been added to syllabus in Universities of Northern Cyprus since 2011. According to the information that the GIS instructor in the Eastern Mediterranean University, Can Kara gave, the GIS Educations have recently been started to attract attention in High Education Boards in North Cyprus. A lecture at the Eastern Mediterranean University is being given under the name of "Introduction to GIS" with 1.5 hours of weekly courses to a group of 30 students (Table 2). This course is given since 2011 at the Near East University, in Education Faculty, Department of Geography as compulsory lesson to the 3rd class students in both semesters. In the 4th class, in the first semester GIS has been put in to the syllabus as application project. All 3 courses are prerequisite. Now, 34 students are taking GIS Lesson. In the research conducted, the lecture as implemented by using students' laptop computer instead of using GIS Lab. This lesson should start to be given in Engineering Faculty.

Table 2 Introduction to GIS in Eastern Mediterranean University- North Cyprus (Kara, 2011)

Week	Course Title
1	Introduction to Geographical Information Systems
2	GIS Applications and Interfaces, Displaying Data with GIS Tools (Lab)
3	Global Map Projections and Datum Systems (Lab)
4	Database Development and Querying, Working with Tables (Lab)
5	Working with Spatial Data, Vector and Image based Data Development (Lab)
6	Editing Data, Basic Editing Tools, Vector Data and Table Editing (Lab)
7	Map Layouts and Basic Map Development (Lab)
8	3D Modelling with GIS Tools (Lab)
9	3D Modelling with GIS Tools (Lab)
10	Student Project(Lab)
11	Student Project(Lab)
12	Student Project(Lab)
13	Student Project(Lab)
14	Student Project(Lab)
15	Student Project(Lab)

5- Result and Suggestions

The way for using GIS commonly passes through education and raising of awareness. Studies are being implemented in order to popularize the usage of the GIS, which is the biggest assistant of directors in management and decision support mechanism in developed countries. Within this framework, Municipalities and Cadastre and

Mapping Department must take the leadership of this work. The universities in our country should success to be pioneer about GIS Education.

The following suggestions have been done as a result of this work in order to advisory and emphasize the importance of the topic.

• Necessary care is not given to GIS education in North Cyprus. Giving priority to this subject should be provided and a study should be carried out considering the demand of public and private sector institutions.

• It is observed that GIS software companies who truly care and focus on GIS education (Esri, Netcad etc.) became prominent in the world and Turkey. These vendors should give courses to their customers to increase the usage of GIS.

• GIS has not learnt in secondary education in North Cyprus, especially in geography lessons and it is an obstacle to learn GIS techniques at early ages. Ministry of Education should support teachers to come to the level of giving GIS lessons by organizing programs and students to meet with GIS at early ages.

• The importance of GIS on undergraduate studies in our universities is realized at late years of the education period and it comes up with the opportunities it creates in obtaining the results of the researches made in terms of analysis and synthesis during post graduate and doctoral examination works. GIS education should be given in from the beginning of the undergraduate study as a compulsory lesson in our universities in related branches and its capacity should be explained to the students with embodiments.

• The number of lecturers about GIS should be increased and the ones who wants to get trained more should be encouraged.

• Guidance about GIS should be provided to students during both undergraduate study and also postgraduate study, students should be encouraged for participating in projects including GIS.

• Because the employment opportunities are limited after graduation, the advantage of using GIS in public and private sector should be explained with various model analyses and students should be encouraged for learning GIS in addition to their skills. Besides, meetings with institutions should be organized to provide employment opportunities.

• GIS certificates should be given to the students who were provided to get education about GIS with enough quality and quantity.

• Students should be provided to prepare the maps of their thesis works by using GIS. These works will provide students to practice enough in GIS.

• Priority should be given to Turkish resource publications and editions about GIS.

• Necessary revisions in staff body of Public Sector and Local Governments should be made and positions about GIS should be maintained.

• Universities should give support on establishing GIS laboratory for popularizing the education.

It is a positive step for the universities in North Cyprus to include GIS education into their curriculum in engineering and education faculties. Students' interest on this subject will start at early ages by doing their works about mapping in geography lessons, by using GIS, in secondary education. GIS education should be supported with the government policy as far as possible in order to follow the developments around the world in this respect. Nicosia Turkish Municipality has trained staff on this subjects and technical staff and potential of the Nicosia Turkish Municipality should be benefited in order to meet the lack of lecturers.

References

Bicen, H. and Cavus, N. (2011). "Social network sites usage habits of undergraduate students: case study of Facebook" *Procedia - Social and Behavioral Sciences*, 28, 943-947.

Dahlberg R., E. (1983), Structure and Context of Cartographic Education in the Mapping Sciences in the United States, International Yearbook of Cartography, 20,151-159.

Demirci A. (2008), Öğretmenler İçin CBS, Fatih Üniversitesi Yayın No:41, İstanbul

Demirci A., Kocaman S. (2007), Türkiye'de Coğrafya Mezunlarının CBS ile İlgili Alanlarda İstihdam Edilebilme Durumlarının Değerlendirilmesi" s. 75, 76, Marmara Coğrafya Dergisi Sayı: 16,Temmuz, İstanbul.

Erengin P., Korucu M. (2009), ARCGIS Eğitim Semineri, LTB, Lefkoşa.

Habibah L., Vasugiammai M. (2011), Technology Integrated Teaching in Malaysian Schools: GIS and SWOT Analysis, Vol:3, No:2, August 2011, World Journal on Educational Technology.

Kara C., (2011) GIS Course Notes, EMU, Famagusta.

Karahoca A., Karahoca, D.,& Yengin (2010). Computer assisted active learning system development for critical thinking in history of civilization. Cypriot Journal of Educational Sciences. *5*(1).4-25.

Karaş İ., R., Kahraman İ. (2011), Uzaktan Eğitim Yöntemi ile Coğrafi Bilgi Sistemi Öğrenimi, TMMOB Harita ve Kadastro Mühendisleri Odası, 13. Türkiye Harita Bilimsel ve Teknik Kurultayı, Ankara.

Korucu M. (2011), Lefkoşa Belediye Sınırları İçerisinde Mimari Yapılanmada Gelişmelerin Kent Bilgi Sistemi Oluşturulması İle Takip ve Analizi, YDÜ, Master Tez Çalışması, Lefkoşa.

Korucu M., Tecer N. (2011), The Relation Between E-Municipality and Urban Information Systems and Situation in Municipalities of TRNC, World Conference on Information Technology, Antalya, Turkey.

Küpçü S. (2007), Özel Sektörde CBS Eğitimi, Coğrafi Bilgi Sistemleri Sempozyumu, KTÜ, Trabzon.

Lateh, H., Munıandy, V.,(2011). Technology integrated teaching in Malaysian schools: GIS, a SWOT analysis. World Journal on Educational Technology. 3(2). 64-74.

Ormsby T., Napoleon E., Burke R., Groess C., Feaster L., (2001), Getting To Know ArcGIS Desktop, Esri Press, California, USA.

Söğüt, S. (2001) Yerel Yönetimlerde Kent Bilgi Sistemi ve İnternete Aktarılması, Y.Lisans Tezi, Gebze Yüksek Teknoloji Enstitüsü, Gebze.

Taş H., İ. (2004), Günümüzde Yüksek Öğretim Kurumlarında CBS Eğitiminin Durumu ve Farklı CBS Eğitim Metotları, 3. Coğrafi Bilgi Sistemleri Bilişim Günleri, 6-9 Ekim 2004, F.Ü, İstanbul.

Taş H., İ. (2006), The Status of Professional Certificate Programs in GIS, 4. GIS Days in Turkey, 13-160 September, 2006, F.Ü, İstanbul.

Tavukcu, T., Gezer, F., Ozdamlı, F.,(2009) Determination of the Views and Success Levels Towards Spreadsheets of University Students Studying With Blended Learning and E-Learning. International Journal of Learrning & Teaching. *1*(1). 10-15.

Turoğlu, H. (2002), "Coğrafi Bilgi Sistemleri (CBS) ve Coğrafya", Türk Coğrafya Kurumu Coğrafya Kurultayı, Gazi Üniversitesi, Bildiriler, Gazi Kitabevi, Ankara.

Valderrama, R., & Cruz, A. (2009). Semantic web application for the taking of decisions for WBE systems. *World Journal on Educational Technology, 1*(2), 98-109.

Wikle, T., A. (1998) "Continuing Education and Competency Programmes in GIS, Int. Journal of Geographical Information Science, 12 (5), 491-507.

Yiğit İ., Ataol M., Dinç A. (2011), Coğrafya Bölümlerindeki CBS Eğitimi ve CBS'nin Gerekliliği, Marmara Coğrafya Dergisi, Sayı:24, Temmuz 2011, İstanbul.

Yomralıoğlu T. (2000), Coğrafi Bilgi Sistemleri Temel Kavramlar ve Uygulamalar, KTÜ Yayınları, Trabzon.